Atty. Dkt. No. 035451-0145 (3682.Palm.SG)

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A lighting system for a display, comprising:

a light source providing invisible light having a wavelength in a spectrum not visible to the human eye;

a reflective layer having phosphorescent coatings in a substrate, the phosphorescent coated surface reflecting the invisible light from the light source and converting the invisible light into visible light visible to the human eye; and

a display layer in which pixels of the display layer may be altered by applying an electrical charge to the display layer in a controlled manner, the display layer being illuminated by the visible light from the reflective layer,

wherein the light source is located below the display layer opposite the side of the display layer viewed by the human eye.

2. (Original) The lighting system of claim 1, wherein the light source includes a light guide.

3. (Currently Amended) The lighting system of claim 1, wherein the light source ~~is provide above the display layer~~ provides infrared (IR) light.

4. (Currently Amended) The lighting system of claim 1, wherein the light source is ~~provided below the display layer~~ a single light source.

5. Cancelled.

6. (Original) The lighting system of claim 1, wherein reflective layer includes metallized coatings on a substrate.

7. (Original) The lighting system of claim 1, wherein the reflective layer includes fluorescent coatings on a substrate.

8. (Original) The lighting system of claim 1, wherein the light source includes a light emitting diode (LED).

9. (Original) The lighting system of claim 1, wherein the light source provides at least one of ultraviolet (UV) light and infrared (IR) light.

10. (Currently Amended) A method of producing an image on a display;

generating a source of ~~invisible~~ infrared light, the light having a wavelength in ~~a~~ the infrared spectrum not visible to the human eye;

distributing the ~~invisible~~ infrared light over the surface of a reflective layer, the reflective layer including at least one of a phosphorescent and a fluorescent surface;

reflecting the ~~invisible~~ infrared light from the light source by the reflective layer;

converting the ~~invisible~~ infrared light into visible light visible to the human eye; and

illuminating a display element with the visible light, the display element including individually selectable pixel elements.

11. (Original) The method of claim 10, wherein the source of light includes a light emitting diode (LED).

12. (Currently Amended) The method of claim 10, wherein the ~~invisible light includes light having wavelengths in the ultraviolet (UV) spectrum~~ display element is a flexible display.

13. (Currently Amended) The method of claim 10, wherein the ~~invisible light includes light having wavelengths in the infrared (IR) spectrum~~ source of infrared light is located behind the display element.

14. (Original) The method of claim 10, wherein the reflective layer includes a metallized surface.

15. (Original) The method of claim 10, wherein the display element is a liquid crystal display element.

16. (Original) The method of claim 10, wherein the display element is an electronic paper (e-paper) display element.

17. (Currently Amended) A display system, comprising:

a light source providing invisible light having a wavelength in a spectrum not visible to the human eye;

a light guide, dispersing the invisible light over a defined region;

a light converter, converting the invisible light to light having a wavelength visible to the human eye, the light converter having metallized coatings on a substrate to reflect visible and invisible light, and the light converter having phosphorescent coatings on the substrate; and

a ~~liquid crystal~~ flexible display layer receiving and transmitting the visible light.

18. (Currently Amended) The display system of claim 17, wherein the light guide overlays the ~~liquid crystal~~ flexible display layer.

19. (Currently Amended) The display system of claim 17, wherein the ~~liquid crystal~~ flexible display layer overlays the light guide.

20. Cancelled.

21. Cancelled.

22. (Original) The display system of claim 17, wherein the light converter includes fluorescent coatings on a substrate.

23. Cancelled.

24. (Original) The display system f claim 17, wherein the light source and light guide combine to form a front lighting system.

25. (Original) The display system of claim 17, wherein the light source and light guide combine to form a back lighting system.

26. (Original) The display system of claim 17, wherein the light source includes a light emitting diode (LED).

27. (Original) The display system of claim 17, wherein the light source provides at least one of ultraviolet (UV) light and infrared (IR) light.

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons which follow.

Applicants have amended claims 1, 3-4, 10, 12-13, and 17-19.

DETAILED ACTION

Claim Rejections – 35 U.S.C. § 103

In section 2 of the Office Action, the Examiner rejected claims 1-4, 6-9, 17-19, 22 and 24-27 under 35 U.S.C. 103 (a) as being unpatentable over Chen (U.S. Patent No. 5,982,092) in view of Baur et al. (U.S. Patent No. 4,142,781) and Umemoto et al. (U.S. Patent No. 6,366,409 B1). The Examiner stated:

> Regarding claims 1, 2 and 6-9, Chen ('092) discloses a lighting system for a display (Figure 3) comprising:
>
> - a light source 40 providing light having wavelength in a spectrum not visible to the human eyes (Figure 3, column 1, lines 10-14, and column 3, lines 10-14);
>
> - a reflective layer 50- herewith also considered as a light converter – having a fluorescent surface reflecting the invisible light from the light source 40, and converting the invisible light into visible light to human eyes (Figure 3, column 3, lines 5-7 and 11-20);
>
> - the light source including a light guide 10 (Chen, Figure 3, column 2, line 54).
>
> - the light source including a light emitting diode (LED) 40 (Figure 3, column 3, lines 11-13); and
>
> - the light emitting diode 40 emitting ultraviolet light (Figure 3, column 1, lines 9-12, and column 3, lines 34-38).
>
> However, regarding claims 1 and 6, Chen ('092) discloses a reflective layer having a fluorescent coating instead of a

reflectiv layer having a phosphorescent coating in a substrate as claimed by the applicant.

On the other hand, Baur et al. ('781) discloses an electro-optical display device (Figure 9) comprising a fluorescent plate 1a, and an additional a layer 25 containing phosphorescent particles embedded in the layer metallic coating (Column 8, lines 17-20).

It would be have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting system of Chen ('092) by providing the layer containing phosphorescent particles as taught by Baur et al. ('781) for the benefits and advantages of providing afterglow of the display after the device in switched-off.

Further, regarding claim 1, Chen ('092) teaches the disclosed light source useable for a liquid crystal display (LCD) (Figure 1 and abstract). However, Chan does not disclose specific features of the LCD.

On the other hand, Umemoto et al. ('409 B1) discloses a planer light source 11 (figures 3 and 4) with a display layer 3 (Figure 3, column 15, lines 5-7) inherently having its pixels altered with an application of electric charge.

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine lighting system of Chen ('092) in view of Baur et al. ('781) with the display layer – LCD – and it positioning as taught by Umemoto for the benefits and advantage of providing a display system with a lighting system having long operational life, energy efficiency and steady illumination.

Regarding claims 3 and 4, Chen ('092) teaches the disclosed light source useable a liquid crystal display (LCD) (Figure 1 and abstract). However, neither combined nor individual teaching of Chen ('092), Umemoto et al. ('409 B1) and Baur et al. ('781) discloses positioning of the light source with respect to the LCD.

On the other hand, Umemoto ('409 B1) discloses a planer light source 11 (Figures 3 and 4) with a display layer 3 (Figure 3, column 15, lines 5-7) inherently having its pixels altered with an application of electric charge. In addition, Umemoto

> teaches alternate positions – below or above – th planer light source 11 (Figures 3 and 4) respective to the display layer 3.
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to locate the lighting system of Chen ('092) in view of Baur et al. ('781) as taught by Umemoto for the benefits and advantage of making the device usable as a light source either for reflection-type or refraction-type LCDs.
>
> Regarding claims 17-19, 22, and 24-27, Chen ('092) in view of Umemoto et al. ('409 B1) and Baur et al. ('781) discloses a display system meeting the limitations of the claims in the same manner as that for meeting the limitations of claims 1-4, 8 and 9 detailed above.

With regard to independent claim 1, independent claim 1 has been amended to recite that the light source is located below the display layer opposite the side of the display layer viewed by the human eye. Accordingly, the light source is located as a back light source. None of Chen, Baur et al., or Umemoto et al. provide for the positioning of the light source relative to the display layer and the human viewer. Accordingly, this element is missing from the cited disclosures and therefore a *prima facie* case of obviousness has not been provided in light of the claim amendments. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

Further, it is important to note that the fact that the back light source is in this case an invisible light source. In conventional back light systems, if the back light system includes a point light source, there is likely to be areas of brightness and darkness over the surface of the display, the areas of brightness more likely to be emanating from the region of the point light source that is behind the display layer. Accordingly, if the point light source behind the display layer is an invisible light source, such localized brightness around the point light source will not be seen. Thus, because none of Chen, Umemoto et al., or Baur et al. provide any teaching, motivation, or suggestion to combine the teachings to provide all of the limitations of claim 1, claim 1 and its dependent claims are therefore allowable.

With r gard to independent claim 17, independent claim 17 has been amended to recite a flexible display layer receiving and transmitting the visible light. None of the references, including Umemoto et al., Baur et al., and/or Chen disclose, teach, or suggest the use of a flexible display layer with the invisible light converting system recited in claim 17. The use of an invisible light converting system for a flexible display is especially advantageous because the display layer being flexible, it is not predictable how the light source of visible light will be seen from a human viewer since the flexible display may be twisted or flexed in a variety of directions. Accordingly, it is beneficial to have a light source which is of an invisible light and having a light converter which may be flexed with the flexible display layer or otherwise evenly illuminate the flexible display layer thereby maintaining the visible light being output from the display layer relatively uniform.

Accordingly, independent claim 17 and its dependent claims include the use of a flexible display layer which is not seen in Chen, Umemoto et al., nor Baur et al., alone, or in any proper combination and therefore claim 17 and its dependent claims are allowable.

In section 3 of the Office Action, the Examiner rejected claims 10-16 under 35 U.S.C. 103(a) as being unpatentable over Chen (U.S. Patent No. 5,982,092) in view of Umemoto et al. (U.S. Patent No. 6,366,409 B1).

> Regarding claims 10, 11, 14 and 15, Chen ('092) in view of Umemoto et al. ('409 B1) obviously meets the method limitations with the disclosure of a device comprising:
>
> -a light source 40 (LED) emitting light in visible to the human eyes, a reflective layer 50 having a fluorescent surface reflecting the invisible light, and converting it to the light visible to the human eye;
>
> -the reflective layer 50 inherently having a metallized surface; and the light source LED 40 providing ultraviolet (UV) light.
>
> Umemoto et al. ('409 B1) discloses a liquid crystal display (LCD) 3 with display layer inherently having its pixels.
>
> However, regarding claims 12 and 13, neither in combination nor individually Ch n ('092) in view of Umemoto et al. ('409

B1) teaches an LED light source emitting infrared light for display system. It would be have been obvious to one of ordinary skill in the art at the time of the invention to make use of LEDs emitting IR light instead of UV light emitting diodes, since use of these types of LEDs for a display system is known in the art.

Regarding claim 16, neither in combination nor individually Chen ('092) in view of Umemoto et al. ('409 B1) teaches the display element being an electronic paper (e-paper) display element.

It has been held that a recitation with respect to the manner in which a claim apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitation.

Finally, it would have been obvious to one of ordinary skill in the art at the time of the invention to make sue of the teachings Chen and Umemoto for meeting the method limitations of Claims 10-16.

With regard to independent claim 10, independent claim 10 has been amended to recite that the source of light is a source of infrared (IR) light. Though both Chen and Umemoto et al. provide teachings of UV light emitting diodes, neither Chen nor Umemoto et al., alone, or in any proper combination, disclose, teach, suggest, or provide any motivation for the use of an infrared light source, the light not being able to be seen by a viewer until that light is distributed over the surface of the reflective layer. Although the Examiner states that IR LEDs are known in the art for display systems, Applicants respectfully submit that the use of infrared light provides advantages that were not seen by the use of ultraviolet light in the prior art. Further, the Examiner states that the use of infrared LEDs in display systems are well known in the art, however, Applicants contend that the use of visible light LEDs are well known in the display system art and not IR LEDs.

Accordingly, because none of the references disclose, teach, or suggest, alone, or in any proper combination, the use of IR light sources, independent claim 10 and its respective dependent claims are therefore allowable.

Atty. Dkt. No. 035451-0145 (3682.Palm.SG)

Aft r amending the claims as set forth above, claims 1-4, 6-19, 22, and 24-27 are now pending in this application.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

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